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COLLUSIVE TRADE ARREARS IN THE STABILIZATION
OF TRANSITION ECONOMIES

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Abstract

This paper shows that in a transition economy with a rigid production structure and a core of unredeemable enterprises, a tight credit policy may subtract more liquidity than the corporate sector can generate by internal restructuring. As a result, cash payments become less common, and the appeal of (uncreditworthy) credit extensions increases, in the expectation that the central bank will be forced ex post to clear unpaid arrears. The intuition is that since restructuring is impossible for the subset of value-subtractors, the enterprise sector will not be able to compensate sufficiently for the reduction of bank finance, and increase incentives for extending unenforceable trade credit. As a result, a severe credit contraction may lead potentially profitable enterprises to postpone adjustment and instead agree to a trade arrears policy, gambling on a collective bail out.

Introduction

One of the fundamental challenges in the transition of Eastern Europe to a market economy is the substitution of a centralized credit system with decentralized financial discipline. The initial step of all reform programs in the region in the period 1989-92 was a sharp tightening of central bank credit policy (see Bruno (1992) and Calvo and Coricelli (1992)). This sharp decrease in central bank refinancing credit to the enterprise sector was aimed at achieving simultaneously control of inflation and financial discipline on state-owned firms. Its success implicitly depended on inducing firms to substitute internal finance for bank credit through a process of productive restructuring. As this adjustment process involves wage restraint, increases in productivity, changes in output composition and layoffs, it is very costly for firm insiders, who are de facto in charge of most state-owned firms, and likely to resist it.

In fact, the initial response to the credit tightening has been generally disappointing, as the adjustment of state firms has proven much more sluggish than anticipated (Blejer and Gelb (1992)). Enterprises delayed their adjustment by accumulating trade debt to suppliers, thus circumventing temporarily the liquidity constraint; these claims soon became overdue. In two countries in particular, Romania and Russia, arrears rose very rapidly after the launch of the stabilization program (Figure 1). As a result, the government in both cases felt compelled to contain the explosion of trade arrears through refinancing operations to clear out interenterprise arrears.[1] However, soon thereafter the level of arrears has began to grow again; moreover, inflation has either remained

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[1] For a discussion of the operation called the Global Compensation Scheme carried out at the end of 1991 in Romania see Clifford and Khan (1992), while for a discussion of the operation in Russia see Ickes and Ryterman (1993).

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high, as in the case of Romania, or approached hyperinflation levels in Russia.[2]

In Romania and Russia (and more recently in Ukraine), the government seemed concerned not only with the level of the arrears but with the large number of enterprises involved. The bail-out was prompted by the fear that the chain of arrears linking enterprises would lead to a contagion effect, generating a systemic collapse of production of "good" firms because of unpaid bills from "bad" enterprises. Such a domino effect would be hard to avoid, as the chain of arrears interferes with an efficient credit selection process among firms;[3] in the case of a chain of arrears, the value of each firm depends on the value of its receivables, which in turn depends on the value of the entire chain of upstream suppliers.[4] An example of this lack of information was the bailout process itself, which in all instances was essentially indiscriminate. This informational haze may interfere also with valuation and privatization.

Interestingly, in countries which have succeed in controlling inflation - like the former Czechoslovakia, Hungary and Poland - interenterprise arrears did not display such an explosive growth (Figure 1). This suggests that in Romania and Russia, enterprises shared an expectation of a likely bail-out, which proved correct ex post. By contrast, the credibility of a non-reflationary stance was higher in Hungary, the former Czechoslovakia and Poland, as the lower level of inflation suggests.

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[2]   In Romania, inflation has averaged 10 percent per month in 1992; in Russia it has accelerated to more than 40 percent a month by the end of 1992.

[3]   An example was the modification of the Hungarian bankruptcy law in 1990, which suspended liquidation procedures for insolvent enterprises whose receivables in arrears exceeded their overdue payables (Mitchell, 1990).

[4]   On this theme see Calvo and Frenkel (1991), Begg and Portes (1992) and Ickes and Ryterman (1993).

It is difficult to distinguish between voluntary and involuntary arrears; obviously, the anticipation of an ex post bail-out gives an incentive to lend freely, even to uncreditworthy firms. It would be hard to argue that there was a well-coordinated scheme, even for countries characterized by a concentrated industrial structure. But coordination does not need to be explicit. Firms may have been individually aware of their collective ability to resist pressure to adjust by creating a long chain of arrears to undermine a policy of tighter financial discipline. This problem is central to the transition process, as it highlights the difficulties of ensuring through aggregate instruments that credit be extended only to creditworthy enterprises and that its terms are binding. These are essential steps to create arm's length relations between investors and enterprises, and thus to establishing a decentralized credit system to substitute for a centralized, passive financial system.

The central question of this paper is whether a decentralized trading and credit process might have generated collective collusive behavior among firms. Our goal is to endogenize the degree of enterprise adjustment in response to an initial tight credit stance, in a realistic model of an Eastern European economy. The specific features of the model are: an inflexible trading structure;[5] unreliable enforcement of contractual obligations; a significant fraction of value-subtracting enterprises which have no chance of becoming productive;[6] and

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[5]   Eastern European firms had long term trading relations with only a few other firms because of production coordination through central planning and the highly monopolistic structure of production (Frydman and Rapaczynski, 1991).

[6]   Good candidates for this type of firms are firms which used to produce exclusively for the former Comecom market. Hughes and Hare (1991) have estimated that between 20 and 30 percent of production in formerly centrally planned economies was associated with firms generating negative value added at market prices. As after reforms very few firms were closed down, many of these "value-subtracting" firms were operating and absorbing resources, including trade credit from other firms.

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uncertainty over the government's determination to suffer output loss in order to achieve macroeconomic stabilization. In this context we show that an excessive contraction of credit may reduce the degree of restructuring, inducing potentially reformable firms to resist adjustment and to extend unenforceable trade credit to other firms.[7]

The intuition is that a contraction in bank credit which reduces corporate liquidity aims at inducing firms to generate internal finance through the threat of failure. This outcome depends on the ability of enterprises to restructure, and on the assumption that input suppliers do not extend credit to illiquid, non viable buyers. However, in Eastern Europe the enterprise sector is unable to fully compensate for the loss of credit liquidity because of the presence of many value-subtracting enterprises; at the same time, enterprises whose buyers are illiquid are forced by the rigid productive structure to accept trade credit. Once a sufficiently large number of firms extend trade credit to each other even if they do not expect repayment, the government may be forced to bail them out. This creates an externality across firms, as the value of trade credit is increasing in the number of firms which do not restructure.

Section I of the paper develops the basic analytical model, which is extended in Section II. Section III contains some concluding remarks and plans for future research.

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[7]   An early view that the credibility of stabilization programs in Central and Eastern Europe may suffer as a consequence of an excessively tight credit policy has been advanced in Calvo and Coricelli (1992). A similar model applied to wage behavior in worker-controlled firms is developed in Coricelli and Milesi-Ferretti (1993).

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Section I   The basic model

We assume that firms maximize their probability of survival minus any restructuring costs, a reasonable objective for state-owned enterprises. Each firm is both a buyer of inputs and a seller of intermediate goods, which in turn are used as inputs by another producer. We envision a circular trading system where all transactions happen simultaneously.[8]

The sequence of events is as follows: first the central bank announces its credit policy $\theta \in [0, 1]$, as a result of which a (random) fraction θ of firms receives bank credit; $\theta = 1$ implies a fully accommodating credit policy and $\theta = 0$ no new bank lending. After bank loans are distributed, firms choose whether to restructure.[9] Next, each firm meets its usual supplier. If the buyer has no liquidity and the supplier refuses to extend trade credit, the buyer cannot obtain its inputs; if there is no further refinancing, it will wither away.[10]

Finally, the Central Bank (CB) observes the number of illiquid firms and decides whether to provide cheap loans (subsidies) to clear their arrears and ensure their survival. Firms know that this choice depends on the fraction of potentially bankrupt firms, but do not know the CB's preferences for supporting output versus containing inflation. As a result, the prior probability of a bailout is not degenerate, even though in equilibrium there is no aggregate

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[8]   This simplifying assumption rules out any effect of information about firms along a productive sequence, which is likely to be significant in practice.

[9]   Because firms make their choice before they know their traditional trading partners' choice, this rules out explicit collusion. However, in equilibrium all firms take into consideration the likely choices of other firms, which may lead them to implicitly coordinate on a collective collusive action.

[10]   To maintain this circular setup, we assume that if a firm's supplier was unable to produce, the firm may be supplied from the supplier's supplier.

uncertainty over the number of potential bankruptcies.

Firms which choose to restructure, denoted as R, are able to fund their purchases with internally generated cash; moreover, restructuring upgrades their output so that they have the option to switch sales to export markets for cash. However, a firm which chooses R imposes a cost c on its insiders. This cost varies across firms, and is uniformly distributed on [0, C]. The presence of value-subtracting firms implies C > 1.

Firms which do not receive a bank loan and choose not to restructure, denoted by NR, must rely on credit by their suppliers to purchase its inputs. The payoff to a NR firm which cannot pay cash or obtain credit is zero in the absence of a bailout, reflecting de facto liquidation.

We assume that when a buyer has some liquidity, its supplier can demand a cash payment. This will occur only if the buyer has restructured or if it has received bank credit; thus the probability of receiving cash equals $\theta + (1-\theta)\lambda_2$. If the buyer is unable to pay cash, the selling firm must choose whether to extend trade credit. While a R firm can switch to the export market for a certain payment, a NR firm has no such alternative; because it still produces poor quality goods, it can only sell to traditional buyers. As a result, a NR firm is always forced to extend trade credit if its buyer has no liquidity.

To highlight the disadvantages of trade credit, it is assumed that a trade debtor cannot be forced to repay its trade arrears, which will be repaid only in the case of a collective bailout. As a result, the value of trade credit depends on the probability of a bailout, denoted by q. This probability is endogenous, reflecting the actual degree of adjustment λ. Figure II illustrates the game.

Enterprise strategies

A firm which chooses R will be able to fund its input purchases and to sell its output on the export market for cash payment; thus it will never extend trade credit (unless the probability of a bailout is one). Thus a R firm survives with certainty: its payoff is independent of other firms' choices and equals $1-c$.

We denote by λ_1 the fraction of firms which receive bank credit and choose R, and by λ_2 the fraction of firms which do not receive bank credit and choose R. The total degree of adjustment is then given by

$$\lambda \equiv \theta\lambda_1 + (1-\theta)\lambda_2 \tag{1}$$

A firm which is financed by bank credit (henceforth BF) can pay cash for its inputs and thus does not face the risk of not being able to produce. However, it still may choose to adjust to avoid being forced to extend risky trade credit to an illiquid traditional buyer. It will pay to do so when:

$$1 - c \geq \theta + (1-\theta)\lambda_2 + (1-\theta)(1-\lambda_2)q \tag{2}$$

namely, when the certainty of survival minus the restructuring costs exceeds the probability of a cash payment for its output from a liquid buyer plus the probability of a bailout for its arrears from an illiquid buyer.

In contrast to a bank-financed firm, a firm which does not receive bank credit (NBF) and chooses not to restructure, may be unable to purchase inputs. This will occur if its sole supplier is a R firm which would rather export. Therefore, as long as $q < 1$, its probability of receiving trade credit equals the probability of a NR supplier, namely $1 - \theta\lambda_1 - (1-\theta)\lambda_2$. Moreover, a NR firm is forced to sell its output to its traditional buyer, which will pay cash only if it restructured or if it received bank credit, which occurs with probability $\theta + (1-\theta)\lambda_2$. In all other cases, the NR firm is forced to extend trade credit, which is repaid only in the case of a bailout.

In conclusion, the payoff to a NR strategy by a firm which obtains no bank credit equals its probability of survival, which is:

$$(1-\phi)\,\text{pr[bailout]} + \phi\{\text{pr[cash]} + \text{pr[no cash]}\,\text{pr[bailout]}\}$$

$$(1-\phi)q + \phi[\theta + (1-\theta)\lambda_2 + (1-\theta)(1-\lambda_2)q] \tag{3}$$

where $\phi \equiv 1 - \theta\lambda_1 - (1-\theta)\lambda_2$ indicates the probability of obtaining trade credit. Then a NBF will adjust when its cost of adjustment c satisfies:

$$1 - c \geq (1-\phi)q + \phi[\theta + (1-\theta)\lambda_2 + (1-\theta)(1-\lambda_2)q] \tag{4}$$

It is immediate to see that $\lambda_1(\theta) < \lambda_2(\theta)$ for all θ. Intuitively, for a given c a R strategy is more attractive for a NBF firm which faces not just the risk of not being paid, but also the risk of not being able to produce.

Enterprises' beliefs

A crucial parameter is given by the initial expectations on the strategy choice by other firms. This is a crucial factor in determining the equilibrium strategies, because the return to a NR strategy depends crucially on other firms' actions. This externality leads to a multiplicity of equilibria. For instance, there is a trivial collusive equilibrium in which because no firm is expected to adjust for any policy θ, the degree of adjustment is always zero. As our goal is to explore implicit rather than explicit collusion, we wish to rule out equilibria driven by self-fulfilling beliefs. We therefore postulate beliefs such that under normal circumstances a sharp credit contraction would lead to a disciplined adjustment process. Specifically, we assume that the beliefs on the fraction of firms λ which choose to adjust in response to a policy θ are based on the rational expectation that a firm will choose a restructuring strategy as long as the resulting improvement in the probability of survival is not outweighed by the adjustment costs borne by insiders.

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Consider first the case of bank-financed firms. Let c_{1*} is the unique value of c which identifies the BF firm which is just indifferent, given θ, λ_1, λ_2, and $q(\lambda,\theta)$, between choosing R or NR, namely the value c_{1*} such that

$$1 - c_{1*} = \theta + (1-\theta)\lambda_2 + (1-\theta)(1-\lambda_2)q \qquad (2')$$

Then the rational belief is that only BF firms with c below c_{1*} are expected to adjust, which implies that:

$$\lambda_1 = prob[c \leq c_{1*}] = c_{1*}/C \qquad (5)$$

Consider next the case of firms receiving no bank finance. The marginal NBF firm is characterized by a restructuring cost given by c_{2*}:

$$1 - c_{2*} = (1-\lambda)q + \lambda[\theta + (1-\theta)\lambda_2 + (1-\theta)(1-\lambda_2)q] \qquad (3')$$

By the same logic, we conclude that enterprises expect the fraction of NBF firms which restructure to be given by:

$$\lambda_2 = prob[c \leq c_{2*}] = c_{2*}/C \qquad (6)$$

Government preferences and the likelihood of a bailout

The final element of a firm's decision whether to restructure is the probability of a central bank-financed collective bailout.

Clearly, if the probability of a bailout is one if all firms extend trade credit, there is an equilibrium where they all choose a NR strategy; none would choose to incur a positive cost c to obtain the same unit payoff. Such a self-fulfilling equilibrium relies on certainty over the government's response to a massive collusive action, which then becomes a self-fulfilling focal point. More realistically, there is significant uncertainty in Eastern Europe on the government's commitment to (or political capacity for) rapid stabilization in response to high social costs. We therefore assume that the policymaker cares

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about reducing inflation and unemployment (or output loss), but its precise tradeoff is not known ex ante. In this section we explore the case of a linear response; later we consider the case of a nonlinear response, caused by the prospect of a "critical mass" crisis in the enterprise sector.[11]

Let ϵ be the fraction of firms which would fail without a general bailout. Then the additional credit expansion necessary to clear out arrears, which would result in an additional inflationary impulse $\Delta\pi$, also equals ϵ. We assume that its ex post relative cost of inflation versus output loss (or unemployment) is described by a random parameter α which is uniformly distributed on $[0, A]$. Thus A is an expected degree of "toughness", a natural measure of ex ante credibility.

Specifically, the ex post loss function takes the form:

$$L \equiv - \alpha\Delta\pi - \epsilon^2 = \alpha\epsilon - \epsilon^2 \qquad (7)$$

In other words, the ex post loss function is linear in the incremental inflation caused by an ex post reflationary accommodation, and quadratic in the fraction of enterprises which would fail in the absence of a bailout.[12]

The fraction of firms which would fail in the absence of a bailout equals the fraction of NR firms which receive either bank or trade credit but whose buyer is an illiquid (i.e., not bank-financed) NR firm, given by:

$$\theta (1-\theta)(1-\lambda_2) + [1-\theta\lambda_1-(1-\theta)\lambda_2] (1-\theta)(1-\lambda_2) (1-\theta)(1-\lambda_2)$$

plus the fraction of NR firms which fail to obtain either bank or trade credit to fund its input purchase, which has a mass of $(1-\theta)(1-\lambda_2)[\theta\lambda_1 + (1-\theta)\lambda_2]$.

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[11]   Another natural interpretation is that the monetary authority is worried about the average quality of firms which run the risk of being liquidated because of unpaid credits to bad firms. As the average quality of NR firms is decreasing in λ, the outcome of this concern for "infection" is the same.

[12]   Our results are similar in the case where the monetary authorities may rescue only enterprises which are net trade creditors.

Then the percentage of firms to be rescued equals:

$$\epsilon \equiv (1-\theta)(1-\lambda_2)\left\{[1-\lambda_1\theta-\lambda_2(1-\theta)](1-\theta)(1-\lambda_2)+\theta\right\} +$$

$$+ (1-\theta)(1-\lambda_2)[\theta\lambda_1 + (1-\theta)\lambda_2] \qquad (8)$$

This implies that:

$$q = \text{Prob}\ [\alpha \le \epsilon] = \text{Min}[1,\ \epsilon/A]$$

$$= \text{Min}[1,\ \frac{(1-\theta)(1-\lambda_2)\left\{[1-\lambda_1\theta-\lambda_2(1-\theta)](1-\theta)(1-\lambda_2)+\theta+\theta\lambda_1+(1-\theta)\lambda_2\right\}}{A}]. \qquad (9)$$

As long as A < 1, there is always uncertainty over the likelihood of a bailout.

Note from the fraction of enterprises at risk (see equation (8)) that not all firms which choose not to restructure will inevitably fail in the absence of a bailout; some succeed to attract liquidity through some form of unenforceable credit, while they are able to obtain a cash payment on their sales. Nothing assures that these firms will be the potentially more profitable firms among those choosing NR. This highlights the redistributive effect across firms of interfirm trade credits.

Results

Both the fraction of value-subtracting firms C and the ex ante credibility level A play a significant role in shaping the output response. In the case of a strong policymaker, the enterprise sector responds to an increasingly tighter credit contraction by a higher degree of adjustment. Figures III and IV illustrate the adjustment response to a credit contraction and the resulting probability of bailout for different values of A and C. For instance, when C=1 and A is high, the graph indicates a smooth adjustment response of the enterprise sector to the rate of credit expansion; it equals zero for $\theta=1$, and rises monotonically as θ decreases. Thus our equilibrium beliefs satisfy the

requirement that under usual circumstances, namely a small fraction of value-subtracting firms and an reputation of central authorities for aversion to inflation, an increasing number of enterprises are induced to adjust as credit is progressively tightened.

However, in the presence of a large subset of value-subtracting firms and when the government's resolve to contain inflation is weak (i.e., A is low), the adjustment response to a tighter credit policy is much reduced. Figures II and IV show that in these circumstances, as bank credit becomes more and more scarce, a further contraction ultimately reduces the degree of microeconomic adjustment.

Thus, the specific features of Eastern European economies are likely to result in an adjustment response following tight monetary conditions which follow a Laffer curve. At first, as credit to the enterprise sector is reduced, a few better firms (namely, those with minimal adjustment costs) will choose to restructure to avoid any risk of illiquidity. But the enterprise sector overall is unable to fully compensate for the loss of liquidity due to the credit contraction, because of the presence of many value-subtracting enterprises; at the same time, enterprises whose buyers are illiquid are forced by the rigid productive structure to accept trade credit. The expectation of a diffused availability of trade credit even for doubtful buyers and enhances an expectation of a massive amount of corporate arrears, which may put intolerable pressure on the central bank to provide cheap refinancing credit to clear them.[13]

Therefore, beyond some level of credit contraction a further tightening results in a sharp decrease in corporate liquidity and thus in a rise in the expected level of trade credit, which soon become overdue; this results into a

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[13]   The view that the credibility of stabilization programs in Eastern Europe suffered as a consequence of a tight credit policy was advanced in Calvo and Coricelli (1992), which focus on its credit crunch effects.

higher probability of a bailout, which in turn increases the attractiveness of trade credit. As a result, the return to not **restructure** increases, and the degree of adjustment actually falls with tighter credit.

Clearly, the cause of this perverse nonmonotonicity in adjustment is the externality across firms' strategies introduced by the potential bailout. To better understand this result, consider the response of its probability q to a tightening of bank credit. Formally:

$$\partial q/\partial\theta = \{B'[1 + 3B^2 - 2B(1-\theta)] + B^2\}/A. \tag{10}$$

where $B \equiv (1-\theta)(1-\lambda)$ is the percentage of NR firms, and

$$B' = \partial B/\partial\theta = -(1-\lambda) - (1-\theta)\partial\lambda/\partial\theta. \tag{11}$$

Thus q will increase as θ is reduced when $B' > - B^2/[1 + 3B^2 - 2B(1-\theta)]$. This is true as soon as the percentage of firms choosing R increases sufficiently slowly as θ is reduced, namely:

$$\frac{(1-\lambda)}{(1-\theta)} > -\partial\lambda/\partial\theta \tag{12}$$

This requires that the ratio of the percentage of NR firms, given by $1-\lambda$, to the degree of credit contraction, given by $1-\theta$, exceeds the **marginal increase** in adjustment resulting from tighter bank credit. In other words, the number of firms in potential default (and thus the probability of a bailout) tends to rise when the increase in λ falls short of the decrease in bank credit. Obviously, the increase in q in response to less credit is particularly sharp when the percentage of R firms decreases as credit is contracted (i.e., when $B' > 0$).

In conclusion, the risk of an ex post bailout following a tight initial monetary stance rises because the liquidity subtracted is compensated only in part by internal adjustment of the enterprise sector. The result is an endogenous increase in the number of enterprises choosing to rely on trade credit.

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Section III   Extensions

The Chain Effect of Trade Arrears

An alternative specification of ex post policy preferences is that the government cares for the impact of failures on the productive chain of producers. This may be a more realistic description of policy preferences in the case of highly integrated production sequence where bankruptcy imposes costs on other suppliers or downstream buyers. Alternatively, a geographic concentration of some industry may impose very high local social costs. A government may be willing to resist pressure from a large number of enterprises from different industries or diffused over the territory, but may be under greater pressure to salvage entire productive sectors or areas which would be devastated by a long chain of uncollectible trade credit. Thus in this section we assume that the political cost depends on the average length of corporate arrears chains.

Assume that the loss function for the CB is now given by:

$$L' = -\alpha_\Delta \pi - E_o[L] \qquad\qquad (7')$$

The expected length of a chain of trade credit depends on the probability that buyers down the chain which receive trade credit will also extend credit. Let δ be the probability that a firm will extend trade credit to its customer. This equals the probability that a NR firm will not find a liquid buyer:

$$\delta \equiv (1-\theta)(1-\lambda) = \epsilon.$$

The expected length of a chain of corporate arrears will then be:

$$E_o[L] = \delta + 2\delta^2 + 3\delta^3 + 4\delta^4 + \ldots =$$

$$= \Sigma_o^\infty k\ \delta^k = \delta/(1-\delta)^2 = \epsilon/(1-\epsilon)^2 \qquad\qquad (13)$$

In this case, the expected probability of a bailout is:

$$q = Prob\ [\alpha < 1/\{1-(1-\theta)(1-\lambda)\}^2] = Min\ \{1/[2A(\theta+\lambda-\lambda\theta)^2],\ 1\} \qquad (9')$$

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Figure V indicates the enterprise adjustment response in this context. The interesting difference in this scenario is the potentially very sharp reversal of the enterprise adjustment response as credit contraction approaches certain thresholds. This reflects the greater sensitivity of q to λ due to the "chain effect"; because the anticipated response of the government is nonlinear, the degree of enterprise adjustment may become very sensitive to small changes to the degree of initial credit contraction. Thus, around certain threshold values of bank credit, even a marginally tighter monetary stance will result in a massive shift in the enterprise sector's restructuring behavior, forcing a bailout with almost certainty.

The Optimal Amount of Initial Credit Contraction

An implication of the analysis is that the disciplinary microeconomic impact of macroeconomic stabilization cannot be fully appreciated by examining the initial monetary stance, but entails an explicit evaluation of the potential for subsequent reflationary actions forced by partial adjustment. An ex ante optimal initial credit stance must then assess the endogenous response of the enterprise sector to appreciate the likely long term monetary consequences.

Suppose that ex ante policy preferences are consistent with the expected future policy objectives described in the last model of differential adjustment between bank and trade-credit financed firms. The monetary authorities aim at minimizing an ex ante loss function consistent with the linear response given by equation (7). Recall that $E[\alpha] = A/2$. Ex ante expected inflation will equal the sum of the initial money expansion plus the probability of a future reflation multiplied by its probability; this implies a loss function of the type:

$$L \equiv - E_o(\alpha\pi) - \epsilon^2 = - \tfrac{1}{2}A[\theta + q\epsilon] - (1-q)\epsilon^2 \tag{14}$$

where ϵ is the percentage of firms at risk of bankruptcy given in equation (8).
Making use of the linear response $q = \epsilon/A$, the optimal choice of the initial
credit creation θ is given by the solution to the loss minimization program:

$$\text{Min}_\theta \ L \equiv - \tfrac{1}{2}A\theta - \tfrac{1}{2}A\epsilon^2 - (1-\epsilon/A)\epsilon^2 \qquad (15)$$

which requires:

$$\epsilon'(\theta^*) = \frac{A^2}{6\epsilon(\theta^*)[A-\epsilon(\theta^*)]} \qquad (16)$$

While this solution cannot be evaluated analytically, it is possible to
develop an intuition for the optimal credit policy for both a strong and a weak
policymaker. Consider first the case of a monetary authority which is expected
to be very averse to inflation, so that A exceeds one. Then the expression (16)
is certainly positive (and presumably large) as $0 \leq \epsilon \leq 1$. Recall that ϵ
indicates the fraction of enterprises which choose NR and are threatened by
bankruptcy; it is therefore negatively correlated with the degree of adjustment
λ. The optimal policy θ^* for an inflation-averse monetary authority then occurs
in a point on the adjustment curve where a decrease in credit would lead to less
adjustment. This implies that if adjustment is monotonic in θ, then θ^* coincide
with the corner solution at zero; while if the adjustment curve has a maximum for
some $\theta = \theta^{**}$, the optimal policy will occur to the left of θ^{**}. Then a very
inflation-averse monetary authority will choose to tighten credit beyond the
point of maximum adjustment; this reduces the immediate inflationary impulse
without leading to a sharp increase in the probability of a future reflation,
given the diffuse expectation about its reluctance to a bailout.

In contrast, we know from our simulations that when A is low the adjustment
response function is uniformly lower for all θ, which also implies that ϵ will
be higher. Then the expression (16) will be positive, indicating that the optimal

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policy θ^* will occur to a point on $\lambda(\theta)$ to the right of its maximum at $\lambda(\theta^{**})$. More generally, an interior solution with partial initial accommodation will be optimal under circumstances of a limited ability of many enterprise to restructure and switch to new markets at a moderate cost to insider; or a limited ability by the policy authorities to resist ex post pressure from the enterprise sector in the face of the threat of a widespread output collapse. In fact, the tightest monetary stance, when correctly measured over the entire time horizon of the program, may not call for a maximum initial degree of contraction in the increase of bank credit, but trades off a limited expansion with a reduced probability of a future reflationary shift.

Figure VII presents the value of the ex ante loss function for different choices of credit policy under different scenarios.

Section III   Future Research and Final Remarks

This paper has attempted to explain the impact of macroeconomic stabilization over the process of enterprise adjustment in Eastern Europe. We have shown that the adjustment response to a credit contraction may not be monotonic. As bank credit is made more scarce, there will be initially a favorable response, as firms with low adjustment costs decide to restructure. As bank-supplied liquidity decreases further, however, the accumulation of trade arrears increases because of the higher likelihood of ex post reflation.

The model highlights how a credit contraction, in the context of a weak political framework and in the presence of a core of hopeless firms unable to adjust, may lead to a net reduction in corporate liquidity. This in turns increases the expected size of trade arrears and therefore the desirability for

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better firms as well of postponing adjustment in the expectation of a bailout. The crucial question becomes the net liquidity effect between the direct reduction in bank lending and the self-financing response by enterprises.

The paper concludes that in a contest in which government cannot credibly precommit to resist reflation whatever the state of the enterprise sector, there may be in fact an optimal amount of concessionary credit creation which is a function of the proportion of value-subtracting firms. More generally, we have identified three causes of increased propensity to collude: a large fraction of hopeless firms, poor credibility, or a significant domino effect across the productive chain caused by arrears. This may generate a "critical mass" crisis which would undermine even a very committed resolve to maintain macroeconomic stability. We conclude that an exceedingly tight initial stance may be self-defeating, and result in a worse monetary control than a gradual restriction.

One potentially important aspect of ex ante policy that the paper has ignored is the question of ex ante signalling. Although it is not clear whether a very tight initial monetary stance would be credible, it is conceivable that it may have some shock value if it had an impact on expectations over the likelihood of a future reflationary bailout. Notice, in fact, that the optimal degree of initial credit expansion does appear to depend positively on the value of A, the degree of aversion to inflation by the monetary authorities. One may conjecture that if the authorities had some more precise private information over their future response to output decline, an increase in credit tightness may act as a signal. However, in the context of most Eastern European countries it seems reasonable that the ex post tradeoff depends on unpredictable future political circumstances.

There are many aspects of interenterprise arrears which we have neglected, and would require extensive empirical research. There are clearly differences at the level of industry, size of firms affected and concentration of arrears. An interesting question would be the identification of a sequence effect (the impact of information about the financial position of both suppliers and buyers). Thus a precise mapping of debtor and creditor sectors could not abstract from their position in the value chain. To identify these subsets of firms, the distinction of net versus gross arrears is important. Gross arrears refers to the sum of all overdue payables of enterprises.[14] Net arrears are defined as the sum of the net debt positions of net debtor enterprises; they offer a direct measure of potential insolvency. However, in the presence of chain effects the total amount of gross arrears is arguably a better measure, as interenterprise credit can transfer default from a set of enterprises to another.

A measure of this phenomenon is given by the Romanian experience. In 1992 net arrears were about 30 percent of gross arrears in the Romanian industrial sector;[15] gross arrears rose to 50 percent of GDP, inducing a generalized bailout (Kotzeva, 1993). In Bulgaria, which experienced a similar sharp contraction in real bank credit, trade credit rose two and half time from May 1991 to March 1993, while trade credit in arrears rose even faster to 10 percent of GDP. While the number of Bulgarian firms with sizable net debts was small, the number of firms affected by arrears was extraordinarily high, encompassing almost all state enterprises. A long chain of arrears seems to have developed around

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[14]   Of course, for the economy as a whole net debt positions are necessarily balanced by net credit positions. However, the industrial sector may be running a significantly negative net trade arrears position if it is indebted to the trade sector or to foreigners for imported inputs.

[15]   A similar ratio is observed for Russia (see Ickes and Ryterman).

a small number of net debtor firs. In a survey of one-hundred and sixty state-owned enterprises in July 1993, managers of Bulgarian firms with high arrears singled out the sharp fall in bank credit, the lack of choice of suppliers and customers and the volume unpaid receivables as the most important causes of their overdue payables, confirming the chain effect of arrears. Even more interesting is the overwhelmingly affirmative response to the question: "Do you expect a government bail-out of bank arrears?" (Kotzeva, 1993). While no clearing of interfirm arrears is actively debated in Bulgaria, almost a fifth of the respondents admitted that suppliers provide goods on credit to uncreditworthy enterprises in the expectation of a bailout. The percentage was probably much higher in Romania, where arrears were cleared twice.

Figure I suggests that in Central European economies with a stronger monetary credibility, and which resisted any bailout from the beginning, the creation of arrears was discouraged. In addition, success at stabilization and adjustment may at least in part reflect their economies' greater access to Western markets, as well as a more limited fraction of value-subtracting enterprises. These desirable features thus have also an indirect benefit of discouraging inertial, collusive behavior which has undermined stabilization and adjustment in other formerly planned economies.

References

Begg, David and Richard Portes (1992) "Enterprise Debt and Economic Transformation: Financial Restructuring in Central and Eastern Europe", in Colin Mayer and Xavier Vives, ed <u>Capital Markets and Financial Intermediation</u>, Cambridge University Press

Blejer, Mario and Alan Gelb, "The Contraction of Eastern Europe's Economies" (1993) in Mario Blejer et al. (eds) "Eastern Europe in Transition: From Recession to Growth?" World Bank Discussion paper no 196

Bruno, Michael "Stabilization and Reform in Eastern Europe: A Preliminary Evaluation", IMF working paper, March 1992, Washington DC

Calvo, Guillermo and Fabrizio Coricelli "Stabilizing a Previously Centrally Planned Economy: Poland 1990", <u>Economic Policy</u> Vol 13 (1992)

Calvo, Guillermo and Fabrizio Coricelli "Credit Market Imperfections and Output Response in Previously Centrally Planned Economies", IMF mimeo, 1993

Clifford, Eric and Mohsin Kahn "InterEnterprise Arrears in Transforming Economies: The Case of Romania", IMF working paper, July 1992, Washington DC

Coricelli, Fabrizio and Gianmaria Milesi-Ferretti, "The Credibility of Big-Bang Programs: Note on Wage Claims and Soft-Budget Constraints", <u>European Economic Review</u> (1992) Vol 37

Frydman, Roman and Andrzej Rapaczynski (1991) "Markets and Institutions in Large Scale Privatization", in Vittorio Corbo et al. (eds) <u>Reforming Central and Eastern European Economies: Initial Results and Challenges</u>, World Bank, Washington DC
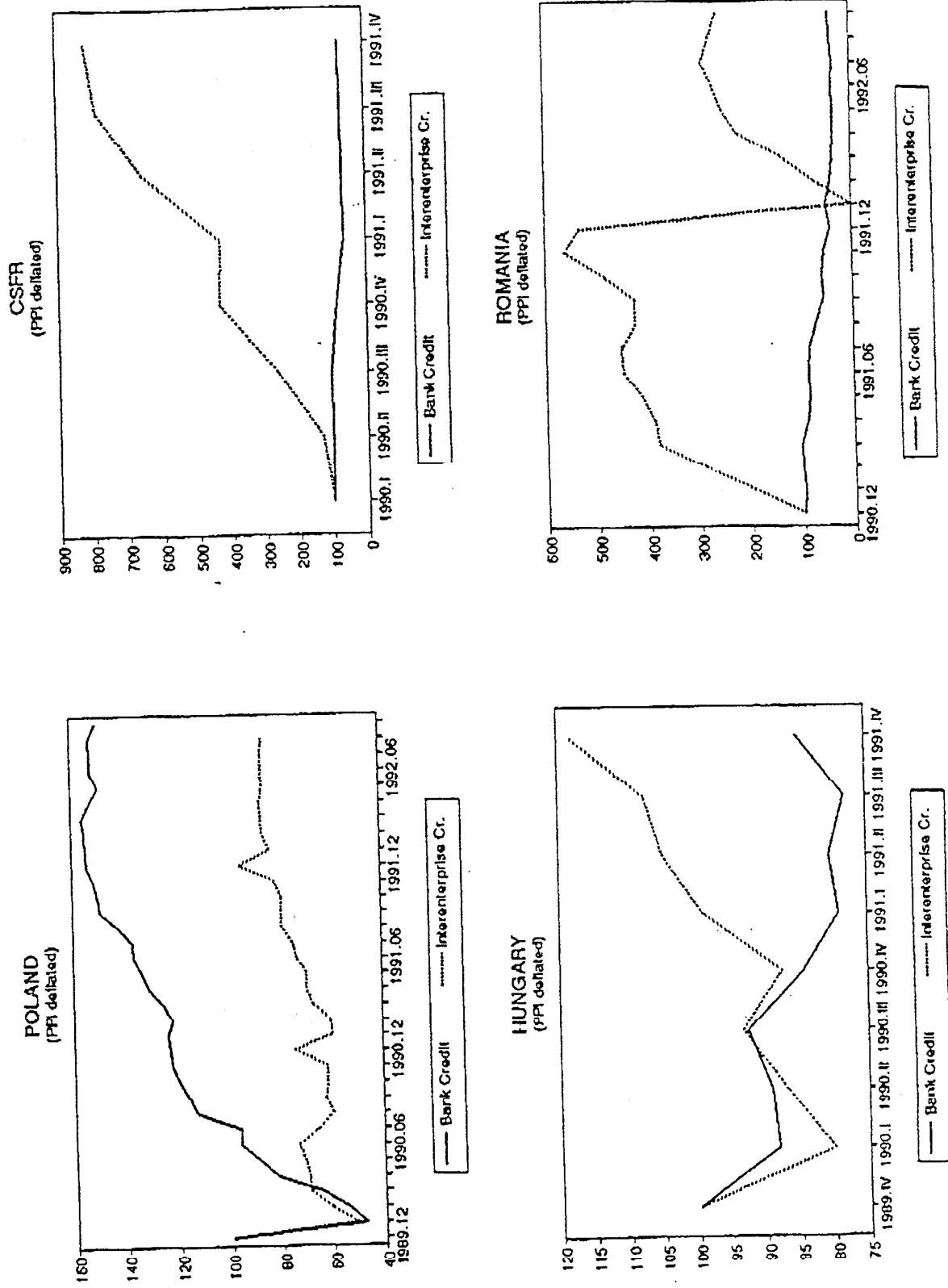
Hughes, Gordon and Paul Hare (1991) "Competitiveness and Industrial Restructuring in Czechoslovakia, Hungary and Poland", <u>European Economy</u> no 1

Ickes, Barry and Randi Rutherland (1993) "Roadblock to Economic Reform: Inter-Enterprise Debt and the Transition to Markets", February, World Bank mimeo, Washington DC

Kotzeva, Mariana, 1993 "Corporate Arrears in Transition Economies: The Case of Bulgaria", Central European University Master Thesis, Prague, Czech Republic

Mitchell, Janet, 1993 "Creditor Passivity and Bankruptcy: Implications for Economic Reform", in Colin Mayer and Xavier Vives (eds) <u>Capital Markets and Financial Intermediation</u>, Cambridge University Press

FIGURE 1

POLAND
(PPI deflated)

CSFR
(PPI deflated)

HUNGARY
(PPI deflated)

ROMANIA
(PPI deflated)

Bank Credit   Interenterprise Cr.

Source: Calvo and Coricelli (1993)

Figure II : The Game

GOVT — sets credit policy

NATURE — assigns bank credit randomly

FIRM — restructuring decision

FIRM — financing of inputs

FIRM — financing of sales

NATURE — chooses ex-post policy preferences

Potential Bailout

Figure III: Adjustment
as a function of reputation (C=1)
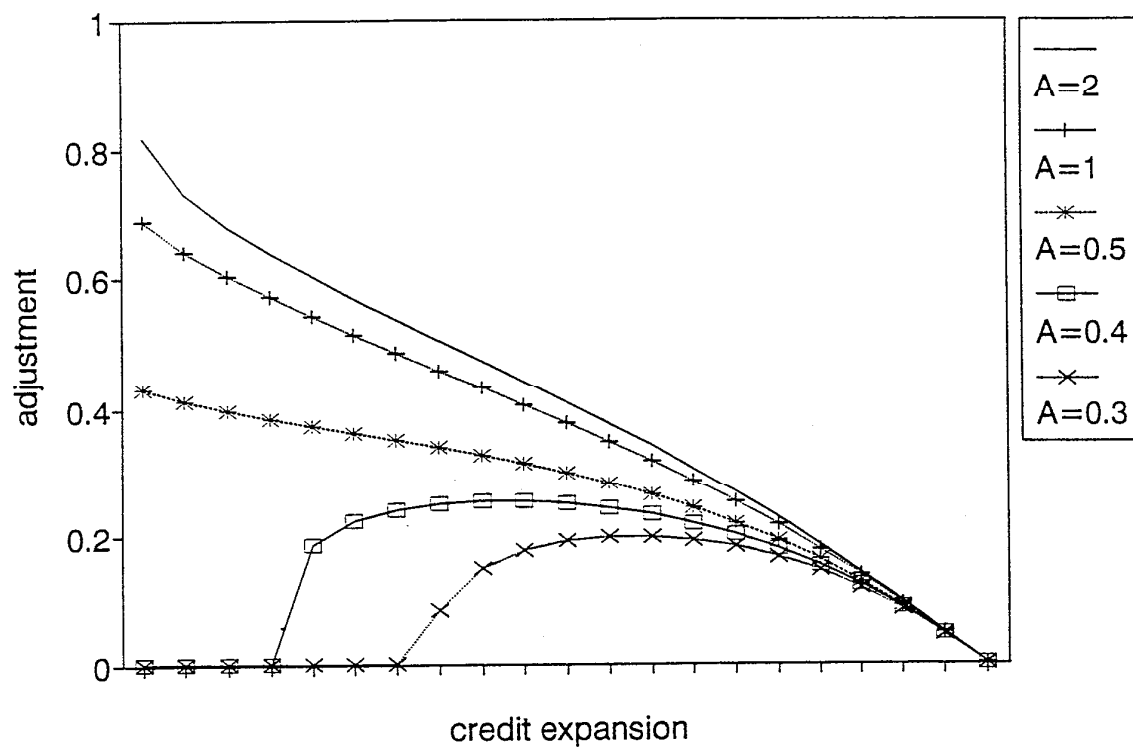
Figure IV: Adjustment as a function of the fraction of value-subtractors

none, high A
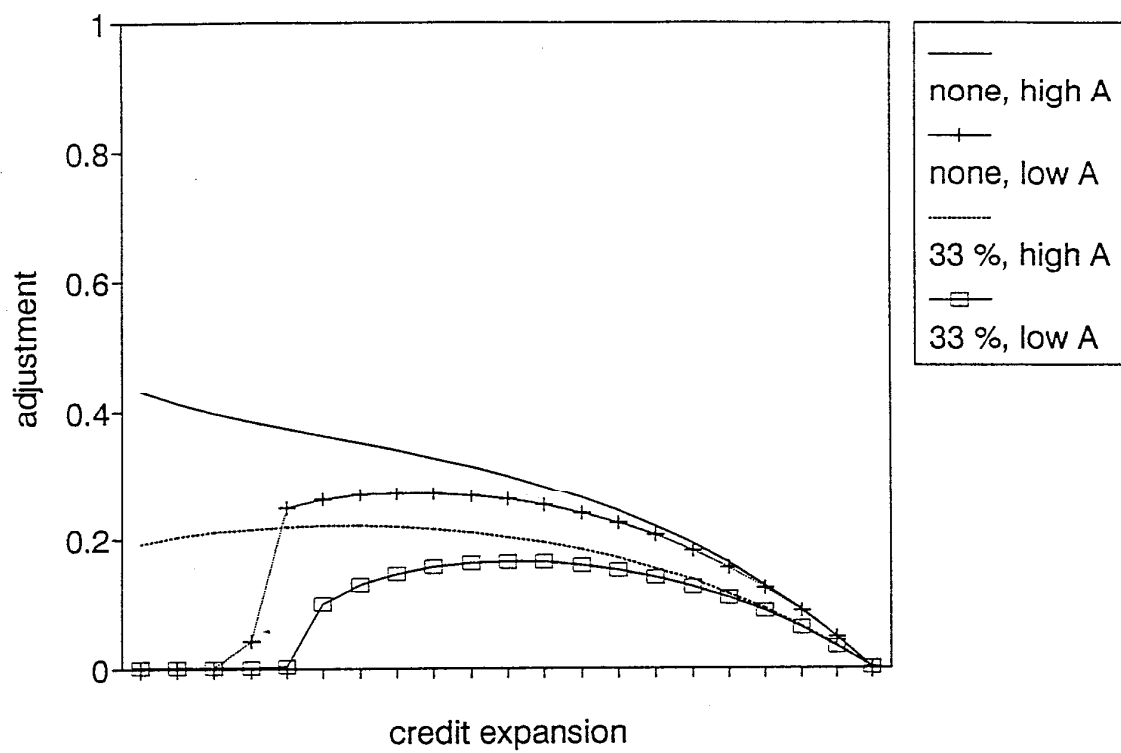none, low A
33 %, high A
33 %, low A

adjustment

credit expansion

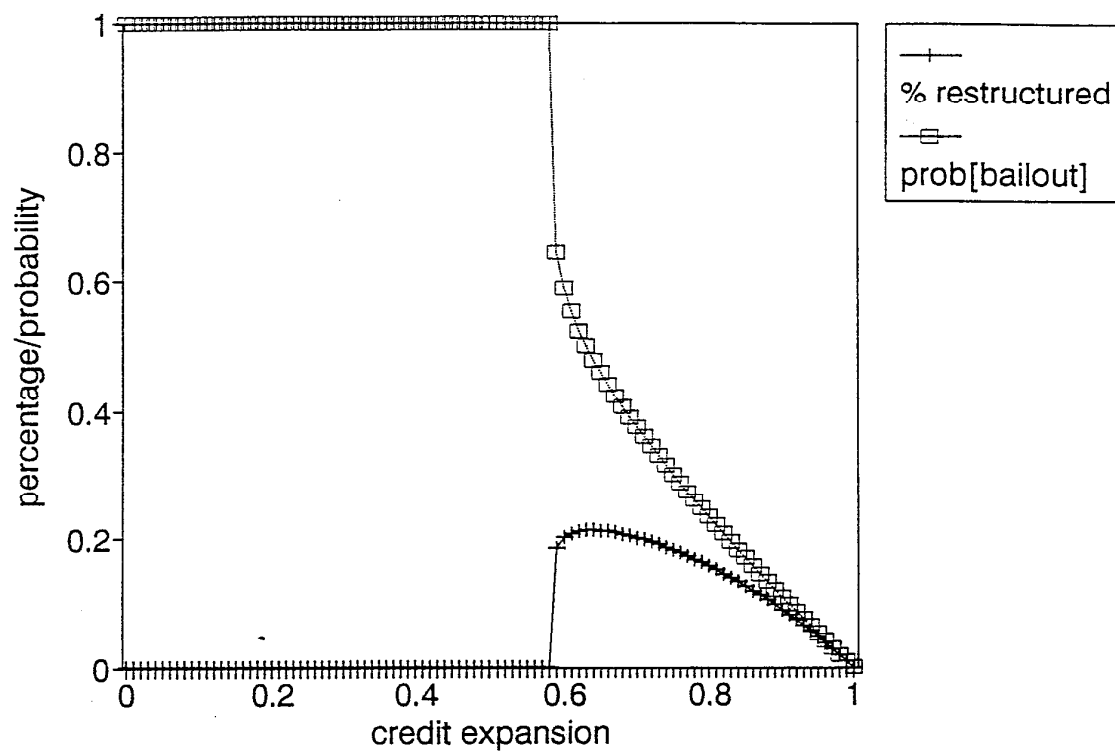Figure V: Adjustment and Probability
of Bailout under Chain Effect

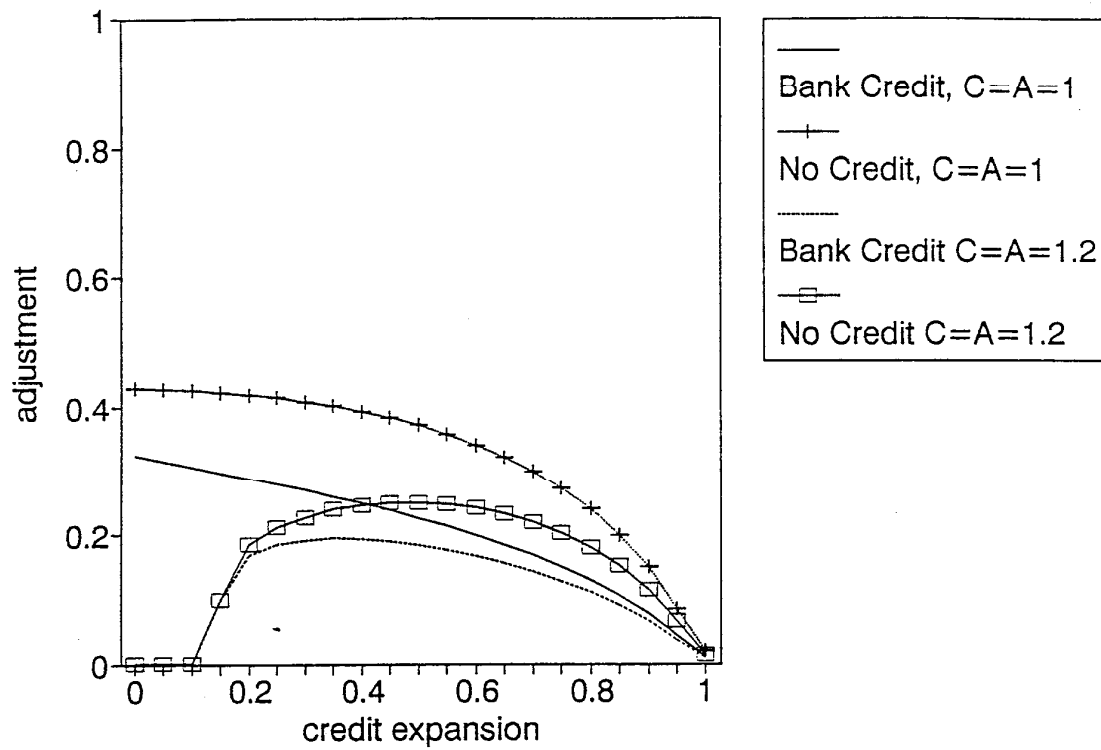Figure VI: Differential Adjustment
of Credit-Funded and Unfunded Firms

Figure VII
Expected loss and credit policy choice